

Supersedes: ISO/TC 184/SC 4/

**Industrial automation systems and integration –
Integration of life-cycle data for oil and gas production facilities –
Part 1: Overview and fundamental principles**

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ABSTRACT:

This document provides an overview of ISO 15926

KEYWORDS:

industrial data, oil and gas, facility, life-cycle, integration, overview

Project leader: Nils Sandsmark
POSC/CAESAR
PO Box 490
1301 Sandvika
Norway
Telephone: +47 67 12 86 93
Fax: +47 67 12 86 99
Email: nils.sandsmark@saga.com

Part editor: Julian Fowler
PDT Solutions
22 Greenwood Street
Altrincham WA14 1RZ
UK
Telephone: +44 161 929 4437
Fax: +44 161 929 4438
Email: jfowler@pdt solutions.co.uk

Comments to reader:

This is a first draft of ISO 15926-1 for review by members of WG3 T21 "Oil and gas". Reviewers are requested to bring their initial comments to the meeting of WG3 T21 to be held in Orlando FL, USA on 1998-02-03. An additional comments should be sent to the Project Leader no later than 1998-02-18. A revised working draft will be issued before the ISO TC184/SC4 & WGs meeting in Bad Aibling, Germany (6/98).

Interim editorial guidelines, and an accompanying Word template, have been used in the preparation of this document. These guidelines apply the requirements of the ISO/IEC Directives 3, and appropriate requirements of the SC4 Supplementary Directives for ISO 10303. Editorial notes and issues within the text are indicated through the use of boxed text.

Document type: International Standard

Document subtype: Not applicable

Document stage: Working Draft (20)

Document language: E

File name: part1v03.doc

Template: isobasw6.dot

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 15926-1 was prepared by Technical Committee ISO/TC184, *Industrial automation systems and integration*, Subcommittee SC4, *Industrial data*.

ISO 15926 consists of the following parts under the general title *Industrial automation systems and integration – Integration of life-cycle data for oil and gas production facilities*:

- Part 1, Overview and fundamental principles;
- Part 2, Data model;
- Part 3, Methodology for the development and maintenance of reference data libraries.

The structure of this International Standard is described in ISO 15926-1.

Annex A forms a normative part of this part of ISO 15926.

0 Introduction

Numbering of the Introduction and of subsections within in (0.1, 0.2, etc. is permitted by the ISO/IEC Directives Part 3 but has not (to the best of my knowledge) been used previously within SC4. Input from the Quality Committee is required with respect to this.

0.1 Background

Information concerning the engineering, construction and operation of oil and gas production facilities is created, used and modified by many different organizations throughout a facility's life. Economic, safety and environmental considerations demand that this information is available to owners and operators of production facilities, contractors, and regulatory bodies in a consistent, integrated form. This requirement can be satisfied by specifications that prescribe the structure and meaning of data that is shared by organizations and disciplines involved in all stages of a facility's life-cycle.

The need to increase the cost efficiency of oil and gas facilities is leading to business practices that depend on the efficient integration and sharing of plant information in a computer-sensible form:

- Many users' needs now span more than one of the traditional information views. Safety and environment are two examples of this.
- Concurrent engineering requires design work to progress in parallel, with the state of the design being available electronically, in computer-sensible form, to other engineering, planning, purchasing and logistical activities.
- Significant cost savings are expected from standardisation of component specifications. The information about these specifications is required in computer-sensible form for easy incorporation into facility designs and requirements.
- In the past, hand-over of plant design information was often restricted to design drawings and paper documents. Use of this information in managing the operation and modification of the plant was restricted to manual processes, or the information had to be redefined in a format suitable to the required application. Having the plant design and equipment information in computer-sensible form increases the efficiency and effectiveness of the operational phase of the plant.
- Accurate computer-sensible information about the plant performance throughout its lifetime is of high value, for optimising future modifications to the plant and for designing new plants on the basis of experience with existing plants.

By using a consistent context for data definitions, the information types used in the various aspects of the plant lifecycle can be brought together. This allows information to be integrated, shared and exchanged in a consistent, computer-sensible form.

0.2 Purpose of ISO 15926

The purpose of this International Standard is to facilitate integration of data to support all the activities associated with the lifecycle of oil and gas facilities. To do this, the data model must record the meaning of the lifecycle information in a single context supporting all the views that process engineers, equipment engineers, operators, maintenance engineers and other specialists may have of the facility.

Traditionally, data associated with process plants have been concentrated on some individual view of the plant at a point in time. Such data are usually defined and maintained independently of other user

groups resulting in duplicated and conflicting data that cannot be shared either within the company or with business partners of the company.

0.3 Description of ISO 15926

ISO 15926 is an International Standard for the representation of oil and gas production facility life-cycle information. This representation is specified by a generic, conceptual data model that is suitable as the basis for implementation in a shared database or data warehouse. The data model is designed to be used in conjunction with reference data - instances of the generic data model that are associated with particular application semantics.

ISO 15926 is organized as a number of parts, each published separately. This part of ISO 15926 provides an overview. It specifies the contents and functions of the different parts of ISO 15926 and the relationships between them, and describes:

- an overview of ISO 15926;
- the structure of ISO 15926;
- definitions of terms used throughout ISO 15926.

Industrial automation systems and integration – Integration of life-cycle data for oil and gas production facilities – Part 1: Overview and fundamental principles

1 Scope

This International Standard provides a representation of data associated with engineering, construction and operation of oil and gas production facilities. This representation supports:

- the data requirements of the oil and gas industries in all phases of a facility's life-cycle;
- sharing and integration of data amongst all parties involved in the facility's life-cycle.

The following are within the scope of ISO 15926:

- a conceptual data model that supports representation of all life-cycle aspects of an oil and gas production facility;
- development and maintenance of reference data libraries that, in conjunction with the conceptual data model, support consistent management and use of life-cycle data by different disciplines and organizations involved in the life-cycle of an oil and gas production facility.

The scope of business activities that are supported by ISO 15926 is illustrated in Figure 1¹, which shows the main activities and data flows required throughout the lifecycle of a facility.

¹ This Figure is based on the Process Plant Engineering Activity Model

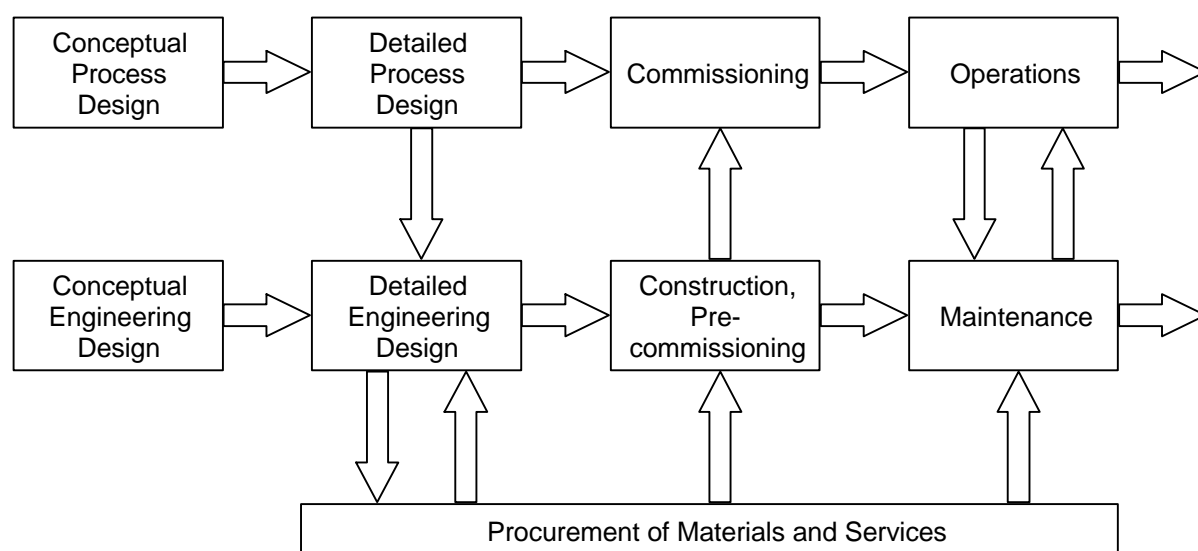


Figure 1: oil and gas production life-cycle activities

Within this framework, the focus of this International Standard is on data supporting the design, engineering and maintenance activities for process systems, electrical systems and instrumentation systems.

NOTE - the support for a specific life-cycle activity depends on the use of appropriate reference data in conjunction with the data model defined in ISO 15926-2.

The following are outside the scope of ISO 15926:

- commercial, business, and administrative data that is not directly related to oil and gas production facilities;
- the content of reference data libraries.

Addition of a Part 4, containing a core set of reference data, would obviously change this statement.

This part of ISO 15926 provides an overview of this International Standard. The scopes of the other parts of ISO 15926 are defined within those parts.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO/IEC 8824-1:1994, *Information technology – Open systems interconnection – Abstract syntax notation one (ASN.1) – Part 1: Specification of basic notation*.

3 Terms and definitions

To be added: we need to review the glossary of terms in Snapshot C/D and determine which are appropriate for inclusion here. The following lists the terms (without, as yet, definitions, that are believed to be necessary for this part.

3.1 ANSI/SPARC

3.2 application protocol (AP)

3.3 data warehouse

3.4 operational data

This is the term that has been used in the Shearwater project to refer to data instances that are specific to a facility, project, etc. I have added the term on the basis that it is used later in the document.

3.5 reference data

3.6 reference data library

4 Overview of ISO 15926

There is still substantial repetition of content between this clause, the Introduction, and the Scope statement. The intent may be better realized combining 4.1, 4.2 and 4.3. This will have to be rationalized before the next working draft is released.

4.1 Usage and applicability

This International Standard is applicable to implementation of databases or data warehouses that enable integration and sharing of data amongst different participants in the life-cycle of an oil and gas production facility. The generic data model specified in ISO 15926-2 provides a suitable conceptual model for such a database or data warehouse.

Having reworded the first sentence of this subclause to "is applicable to" this now to be more of the nature of scope information.

NOTE - See Annex C of ISO 15926-2 for further information concerning the nature of conceptual data models.

In order to share information, common values and meanings must be assigned to the data elements that represent particular things in the real world. Reference data elements play this role. ISO 15926-3 specifies the methodology for the creation and maintenance of reference data.

The originally planned contents of this subclause, derived from POSC/CASEAR Snapshot C/D, have been placed in the Introduction and in the Scope statement..

4.2 Architecture

The architecture that underlies this International Standard is illustrated in Figure 2.

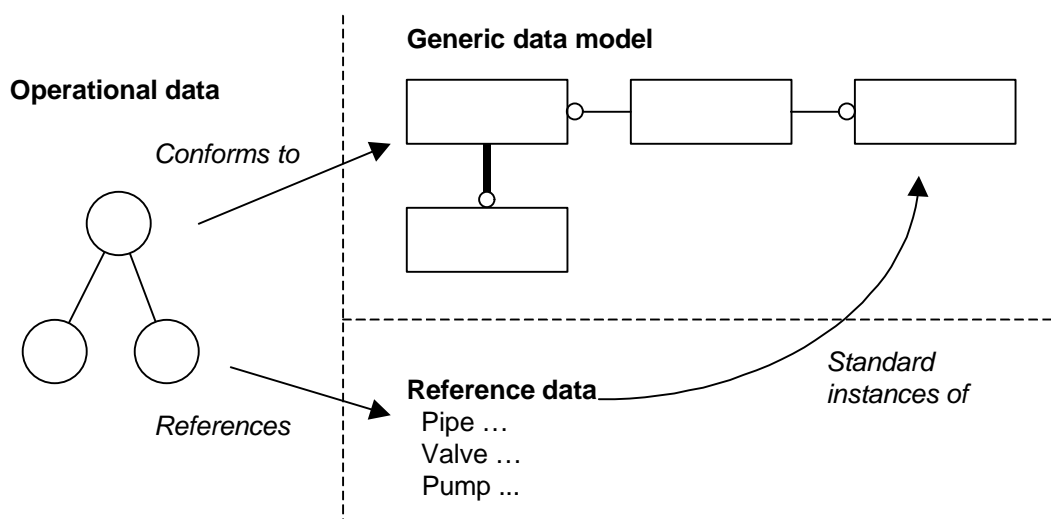


Figure 2 - architecture

The operational data that describes a given facility is structured according to the generic data model. Consistency of meaning within the operational data, and across multiple sets of operational data, is provided through reference to shared, standard instances of the data model (reference data).

4.3 Components of the standard

ISO 15926 is divided into a number of parts. Each part has a unique function.

ISO 15926-1 (this part) provides an overview of ISO 15926.

ISO 15926-2 specifies the data model that supports the representation of technical oil and gas production facility information, and the management of this data such that any useful application or view can be supported by databases that satisfy the data model specification. The data model does not describe or specify any particular application viewpoint of oil and gas facility information.

ISO 15926-3 specifies the methodology for the development and maintenance of ISO 15926 compliant reference data.

NOTE - Managed collections of such reference data (reference data libraries) may be the subject of further standardization.

This NOTE is intended as a placeholder for future references to Part 4.

4.4 Information object registration

In order to provide unambiguous identification of schemas and other information objects in an open information system, this International Standard employs the registration technique defined in ISO/IEC 8824-1.

NOTE - this registration technique is that defined in clause 4.3 of ISO 10303-1 for information objects standardized in ISO 10303.

It would be useful if 4.3 of ISO 10303-1 could be generalized so that it could be referenced from here, rather than repeated with minor changes.

This technique identifies objects by their assignment to a tree structure whose root is ISO itself. Each node in the tree is identified by a sequence of integers corresponding to the index of the leaf under each node. Nodes that identify agencies that can further specify inferior nodes are called registration

authorities. There is provision in this technique for having registration provided by national bodies and other identified organizations (including private corporations). A registration authority is automatically granted to the technical committee or subcommittee that prepares a standard in order to identify objects within the standard.

Thus, ISO 15926 is identified by the object identifier:

```
{ 1 0 15926 }
```

Here the initial 1 indicates ISO; the 0 following it identifies the object as a standard, and the number following that is the number of the standard. ISO/IEC 8824-1 also defines identifiers to stand in the place of these numbers; thus 'iso' has the value 1 and 'standard' has the value 0. For multi-part standards, the next number is required to be the part number. Thus, this part of ISO 15926 is identified by the object identifier:

```
{ iso standard 15926 part(1) }
```

Here, the value of the part number is given explicitly, but the notation allows us to associate a term with this value, thereby providing some semantics. The notation for values of this type is defined in clause 28 of ISO/IEC 8824-1, and the predefined assignments are specified in annex B of ISO/IEC 8824-1.

For the purposes of identifying information objects unambiguously within an open information system, ISO 15926 adopts the following conventions:

- The value following the part number shall be version number. By convention, the value of the version number of the first edition shall be 1. The value 0, if used at all, is reserved to refer to DIS documents.
- The value following the version number is used to identify the type of information object defined within the part. The value 1 shall indicate that the object so identified is a schema.
- The value following the object type is an integer that identifies the instance of the object type so identified.
- To meet the syntactic requirements of ISO/IEC 8824-1, replace each occurrence of underscore character “_” in a schema name with a hyphen when defining this value.

EXAMPLE - The oil_and_gas_production_facilities schema defined in ISO 15926-2 can be identified by the value

```
{ iso standard 15926 part(2) version(1) object(1)
  oil_and_gas_production_facilities (1) }
```

5 Relationship to other industrial data standards

The subheadings here are primarily to indicate the intended contents of this clause: it is not yet complete.

5.1 Industrial data representation standards

5.1.1 ISO 10303 “Product data representation and exchange”

ISO 15926 makes use of ISO 10303-11 “EXPRESS” for specification of data models. Implementations of ISO 15926 may be based on any implementation form that has a mapping from EXPRESS.

EXAMPLE 1 - Suitable implementation forms include ISO 10303-21, ISO 10303-22, and the Data Access and Exchange Facilities (DAEF) developed by the Petrotechnical Open Software Corporation (POSC).

Quick editorial note: can we refer to Parts of STEP like this without making them normative references? Is this a correct statement with respect to POSC DAEF? If so, can we legitimately reference a proprietary specification like this?

ISO 15926 supports representation of life-cycle data for oil and gas production facilities in a form that is suitable for implementation in a shared database or data warehouse. ISO 10303 Application Protocols provide specifications for the exchange of well defined subsets of the total life-cycle data. ISO 10303 Application Protocols may therefore be used to specify standard interfaces for the input or output of data stored in a database or data warehouse.

EXAMPLE 2 - ISO 10303-231 specifies how process design information for major equipment items can be exchanged. An interface conforming to ISO 10303-231 may be used to import or export equipment design data that is stored within a database that is based on the ISO 15926 data model.

5.1.2 ISO 13584 “Parts library”

To be added (after discussion with WG2 at Orlando?)

5.1.3 ISO 15531 “Manufacturing management data

Is there a relationship to MANDATE?

5.2 Product and manufacturing standards

To be added: I assume that the content of this subclause will primarily deal with inclusion (directly or by reference) of the contents of other standards within reference data.

Annex A

(normative)

Information object registration

To provide for unambiguous identification of an information object in an open system, the object identifier

{iso standard 15926 part{1} version {1}}

is assigned to this part of ISO 15926. The meaning of this value is defined in ISO/IEC 8824-1, and is described in 0.

NOTE - this is the object identifier that will apply to the published (IS) version of this part of ISO 15926.

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